Verification of a Translation

I, the below named translator, hereby declare that:

My name and post office address are as stated below; that I am knowledgeable in the English language and in the German language, and that I believe the English translation of the attached document titled "Method and device for one- or two-sided application" is a true and complete translation.

I hereby declare that all statements made herein of my knowledge are true and that all statements made on information and belief are believed to be true, and further that all these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statement may jeopardize the validity of any application made thereon.

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File: PU11134 DE
"Belt size press"

Method and device for one- or two-sided application

The invention relates to a method in accordance with the generic term of claim 1, and to a device to accomplish the process in accordance with the generic term of claim 10.

Generic methods and devices are utilized within the scope of coating lines, in order to provide a moving material web, for example a web consisting of corrugated board base paper on one or both sides with one or several layers of coating medium.

In the so-called direct application process the liquid or viscid medium is applied directly by the applicator device to the surface of the moving material web which is being supported during the application process by a rotating support surface, such as a backing roll or a continuous belt. In the indirect application process the liquid or viscid medium is initially applied to a carrier surface, i.e. the surface of a roll serving as an applicator roll, or the surface of one side of a flexible belt, in order to be transferred from there to the material web.

Indirect application is normally done by a so-called film press. This comprises two rolls which together form a nip and which transfer the medium successively or simultaneously to both sides of the material web – or to only one side of the web.

Reference is made to US 5,683,509. In that solution a flexible continuous belt, together with a transfer roll form the press nip through which the web travels. A press shoe is located on the inside of the continuous belt, resulting in an extension of the nip and presses the coating medium that is being applied with this unit,

into the web. This is intended to improve the coating result, specifically by avoiding film splitting.

Additional reference is made to DE 198 23 739 A1 according to which a material web is coated in the wet section, or immediately following the wet section, of a paper machine.

Film or size presses have been in operation for years. They have however, some significant disadvantages and with today's high-speed machines and depending upon the type of fiber web and coating medium do not always provide sufficient coating quality.

The raw material quality of paper or cardboard is continuously decreasing. This applies specifically to the production of corrugated board base paper, which is largely manufactured from recovered paper. Additionally, there is an ever increasing demand for a lower mass per unit area (also referred to as basis weight). The result of this poor raw material quality and lower basis weight is that the tensile strength of the web following the film press coating application is very low, so that frequent web breaks occur after coating in unsupported travel of the web. This equates to enormous production down times and associated high costs.

Film Presses (also known as Speedsizer, Speedcoater, Optisizer, metering size press) frequently cause nip flattening and crushing in the nip. These effects are particularly negative in corrugated board production.

In the field, a web break – particularly in the production of corrugated board base paper – is countered in that modified starches that have a low viscosity and a high solids content are used as coating medium. The low viscosity is intended to provide effective penetration on the one hand, the high solids content is intended to produce

low remoistening on the other hand and thereby rendering possible only a low drop in tensile strength following the film press. Modified starches however, are more expensive compared to crystal starches.

Even these measures do not always lead to satisfactory results.

It is therefore the objective of the invention to develop a method and a device for the production of corrugated board base paper, whereby a deep penetration of the starch containing coating medium into the material web – independent of the basis weight, and by utilizing the starch characteristics – is possible and moreover, web breaks are largely avoided after coating.

The objective is met in accordance with the invention with a method in accordance with the characteristic of claim 1, as well as with a device in accordance with the characteristic of claim 10.

The inventors recognized that the hitherto used starches whose viscosity and solids contents were modified, produced only an insignificant increase in strength of the coated and impregnated material web, compared to crystal starches.

The effect of the starch in the coating medium are clearly increased due to the fact that the pre-dried corrugated board base paper web travels through a press nip only after coating and because the wet, coated and impregnated or sized web is dried only subsequently and also, after the nip a considerable section (ideally this would occur through to the first dryer cylinder of the following drier section) is supported without free draw. A penetration through to the "sheet center" can be achieved, even at low basis weights, resulting in an increase of the web's tensile strength.

A further advantage is that it is now also possible to use crystal starches in spite of the intensive remoistening. Crushing during corrugated board base paper production can be reliably avoided. In addition, these measures in accordance with the current invention result in far fewer web breaks following the coating process.

A particularly advantageous solution of the invention consists in that the support of the moist web is accomplished by means of at least one flexible belt. The support surface on one or both sides of the web can be extended as desired.

Further embodiments of the invention result from the sub-claims.

The current invention is described below in further details, with the assistance of a design example.

Illustrations:

Figure 1: a first example of the solution according to the invention is illustrated as a schematic side view of the device in accordance with the invention.

Figure 2: a second example of the solution according to the invention.

The example selected for Figure 1 illustrates a pre-dried corrugated board base paper web B that already has a dry content of approximately 85 to 95%, following a last dryer cylinder 2 of the pre-dryer group 3 in a machine for the production of the corrugated board base paper running onto a first applicator roll 4. This applicator roll 4 has an applicator device 5 assigned to it with which the web B is coated on it's top side B_o. All known devices, such as a Short Dwell Time Applicator (SDTA) or LDTA (for Long Dwell-Time) open jet nozzle applicators or a curtain coating nozzle are suitable.

A pre-penetration of the coating medium is achieved with this one or two-sided application.

In order to support the web B a transfer belt, that is a flexible continuous synthetic or rubber belt is routed around an additional roll 16, a support or backing roll 7, as well as around several guide or turning rollers 8. A tension roll 21 which is located on the paper machine floor PM_B reacts on the belt 6 from the outside, thereby tensioning it.

Two-sided application is to occur in the selected example. An additional applicator 5a is therefore assigned to the support roller 7. The coating medium is transferred from the continuous belt 6 to the underside B_U of the web B, as soon as the belt 6 makes contact with the web B. The application by devices 5 and 5a may occur simultaneously, or successively in an offset time sequence. If only a one-sided application is to occur on either the topside or the underside of the web, one of the idle applicator devices can be pivoted down. As can be seen in Figure 1, the rolls 4 and 7 together do not form a press nip. This is intentional, so that no crushing of the web is caused and no web breaks occur.

The embodiment illustrated in Figure 1 therefore comprises a long pre-penetration segment P_S that ought to be considerably longer than 100 mm, thereby providing good penetration due to the extended reaction time due to capillary effect. This long distance is particularly advantageous in achieving the desired through-penetration.

Figure 2 which essentially uses the identical references for the identical components as Figure 1 illustrates another variation of the embodiment. There is no roll 4; only the applicator device 5 is provided for direct application onto the topside of the web B_O.

Another feasible variation which is not illustrated here is the provision of an additional continuous belt in place of the roll 4 with which the web B could be supported and again, indirect coating in the same unit onto the material web be achieved.

After passing the penetration segment P_S the web B runs together with the belt 6 - which can be used as applicator and support belt - through a press zone 9.

The press zone may be realized in various ways.

In order to meet the objective which consists in a long dwell time and the avoidance of crushing, as well as to be able to adjust variable line pressures across the entire width of the web B, utilization of a basically known shoe press comes to mind. In the press zone 9 the pre-penetrated starch can so-to-speak "after-penetrate", thereby anchoring itself solidly in the web B.

Another possible embodiment of the press zone may comprise an additional flexible continuous belt 10 running over guide rollers 11, 12, 13. The belt 10 should run with it's inside surface over a slide face of a press shoe 14, whereby the slide face together with a roll 15 - which could for example also be a suction roll – forms a press nip N. This press shoe 14 is shown in only a simplified depiction and may extend over a wide area of the belt 10. The press zone can however also consist of the two rolls 15 and 16 forming a press nip N. In Figures 1 and 2 the roll 16 is illustrated in a dash-dot configuration and embodies a so-called flexonip roll, already known from the press section. This construction is already known from DE 198 20 516 A1 where however there are no statements regarding supporting of the web after squeezing in the coating.

At the same time roll 15 is one of those rolls around which the continuous belt 6 travels, forming the aforementioned backing surface to the roll 16 and/or the belt

acting as press-, support- or possibly applicator belt 10. The continuous belt 10, as well as the continuous belt 6 each form a support surface between them for the web B that is penetrated through after Nip N. The support surface S_F extends essentially to the first dryer cylinder 18 in the following dryer section, for example the after-dryer section 19 of the paper machine.

As indicated by the dashed lines in Figure 2, the continuous belt's 10 surface can be extended to a desired extent, i.e. by adjustment of the guide roller 13. Likewise the belt 6 can also extend its support surface to a desired extent by adjusting the upper guide roller 8. As is also shown in Figure 2, an extended support surface provides for a blow box or suction box 20, or for another type of transfer aid to facilitate transfer of the web or of a transfer strip to the dryer cylinder 18.

In Figure 1 the possibility of supporting the web B in the direction of the location of application is also shown in a dotted line. For this purpose the belt 10 (or a separate belt 10a) can be routed around the roll 4, or around an adequately positioned guide roller. The belt may also be supported additionally by the roll 11.

In another feasible solution which is not illustrated here a continuous belt 10a would replace roll 4 to provide the aforementioned support of the web B, as well as indirect coating at the same location as is being done with the roll 4 with the same device onto the material web.

The belts 6 and 10 are equipped with a drive. In the provided example, rolls 4, 7 15 are driven. In belt 6 this drive is located at the nip N, in order to ensure sufficient pull of the web. In addition, tensioning devices (for example tensioning roller 21) and tension control devices for the belts are provided, as well as the adjustment possibility which is indicated by double arrow at the guide rolls.

In order to facilitate a flawless transfer of the web B to the dryer section 19, a suction roll 22 with or without foil 23 is provided after the press zone 9 or the continuous belt 10. This arrangement allows for a transfer of the web without ropes.

For the sake of completeness it must be mentioned that in order to facilitate a flawless transfer of the web B, one or more showers (not depicted in the drawings) are provided prior to the point where the belt 6 runs onto the applicator roll 4. These provide targeted liquid application onto the belt or the web B, in order to ensure adhesion of the transfer strip or the entire web.

In order to avoid lifting of the web at the press roll 16, additional support belts, so-called fibron belts or other known transfer aids can be provided.

The paper machine section illustrated in Figures 1 and 2 is essentially consistent with a "closed transfer" into the dryer section.

It is also feasible to allocate an additional applicator device 5c to the continuous belt 10, thereby providing for a possible double application onto the topside B_o of the web. This may occur with or without intermediate dying. It is also possible to provide additional support belts 10a....10n, or 6a....6n on one or both sides of the web, which in turn would be provided with associated applicator devices 5a....5n – these being of the same type or acting independently from each other. The advantage of this type of arrangement is in that only a fraction of starch per applicator device is applied. This reduces the re-moistening of the web immediately after the application. The web does not loose consistency, thereby increasing runability.

Overall, it has been determined in tests that the consistency gain of the paper and cardboard web is not approximately 20N/% starch as was the case previously, but 40N/% starch. This means that, while maintaining the same quality the starch

amount used can be reduced by 30%. Or, the quality could be increased accordingly with the same amount of starch use. This is especially important considering the current drop in quality of raw materials used in the production of corrugated board base paper.

Furthermore crystal starches can now also be used.

It must be emphasized that only very few press-nip based web breaks occur any more after the press nip, especially since this saves on production down times (approx. 15 to 20 min. per down time).

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"Belt size press"

Patent Claims

1. Method for one- or two-sided application of liquid through viscid mediums, preferably starch, onto the surface of a corrugated board base paper material web, whereby in the direct application method the coating medium is applied directly onto the surface of the material web. In the indirect application method the coating medium is first applied to the surface of a transfer element, for example an application belt from where the coating medium is then transferred to the material web, and whereby the material web travels through at least one press nip
   characterized in that
   a pre-dried material web (B) is first provided with an one- or two-sided coating application, then travels through the press nip (N) and ultimately continues to travel after the press nip (N) by being supported, and essentially without free draw.

2. Method in accordance with claim 1,
   characterized in that
   the material web (B) is supported by at least one flexible continuous belt (6), whereby it is supported essentially until it reaches the first dryer cylinder (18) of a downstream dryer group (19).

3. Method in accordance with claim 1 and/or 2,
   characterized in that
   the application of the medium onto the underside (underside B_U) of the material web (B) occurs by means of applying the medium to the outside surface of the flexible continuous belt (6).

4. Method in accordance with one or several of the claims 1 through 3, **characterized in that**
the application of the medium onto the other side (topside B_O) of the material web (B) occurs by means of applying the medium to the surface of an application roll (4) and/or to the outside of another flexible belt (10).

5. Method in accordance with one or more of the claims 1 through 4, **characterized in that**
the same belt (6, 10) supports the material web (B)) onto which the medium was applied.

6. Method in accordance with one or more of the claims 1 through 5, **characterized in that**
the application of medium occurs incrementally onto several belts (10, 10a...10n), whereby the material web (B) is supported by at least one of these belts.

7. Method in accordance with one or several of the claims 1 through 6, **characterized in that**
the material web (B) travels through a penetration segment (P_S) of >100 mm prior to reaching the press nip (N).

8. Method in accordance with one or several of the claims 1 through 7, **characterized in that**
the material web has a mass per unit area (basis weight) not exceeding 90 g/m².

9. Method in accordance with one or several of the claims 1 through 8,
characterized in that
prior to the application of the medium, the material web (B) has a dry-content of between approximately 85% and approximately 95%,

10. Device to execute the method in accordance with claim 1, and if desired, one or several of the claims 2 through 9, comprising
- at least one applicator device (5, 5a) for the application of the liquid or viscid medium onto at least one side of the material web (B), and
- at lest one flexible continuous belt (6) that supports the material web (B) with it's outside and that travels over guide rollers (8) with it's inside, and
- one press shoe (14) that, together with the continuous belt forms a press nip (N),
characterized in that
a support roll (7), and another support roll (15) - which is located at a distance from it – also support the continuous belt (6), whereby the support roll (15), together with the press shoe (14) that is located (at a distance from the point of the first application by applicator device (5,5a)) on the outside of the continuous belt (6) form the press nip (N) through which the material web (B) travels only after the application by the at least one applicator device (5, 5a), and
that the continuous belt (6) is configured such, that it supports the material web essentially without free draw.

11. Device in accordance with claim 10,
characterized in that
the applicator device (5) for application onto one side (underside B_U) of the material web (B) is assigned to the outside surface of the continuous belt (6)

whereby the roll (7) forms the backing surface for the applicator device (5)

12. Device in accordance with claim 10 and/or 11,
characterized in that
for application of the medium to the other side (topside B_O) of the material web (B), the applicator device (5a) is assigned to the surface of an applicator roll (4) and/or the outside surface of another continuous belt (10), whereby the continuous belt (10) travels around guide rollers (11, 12, 13) and can be configured as press belt.

13. Device in accordance with one or several of the claims 10 through 12,
characterized in that
the belt (6,10) that transfers the medium that was applied to said belt (6, 10) to the material web (B), also supports the material web through to the first dryer cylinder (18) of the dryer section (19).

14. Device in accordance with one or several of the claims 10 through 13,
characterized in that
several flexible continuous belts are provided (10, 10a... 10n) for incremental application onto the topside (B_O) of the material web (B) and that at least one of these belts supports the material web (B) through to the first dryer cylinder (18).

15. Device in accordance with one or several of the claims 10 through 14,
characterized in that
a penetration segment (P_S) of > 100 mm is provided between the point of medium application to at least one side of the material web and reaching the press nip (N).

16. Device in accordance with one or several of the claims 10 through 15, **characterized in that**
following the press nip (N) a suction roll (22) and/or a suction or blow box (23) is provided for the transfer of the material web (B) to the first dryer cylinder (18) of the dryer section (19).

17. Device in accordance with one or several of the claims 10 through 16, **characterized in that**
continuous belt (6) as well as the second continuous belt (10) are equipped with a drive.

18. Device in accordance with one or several of the claims 10 through 17, **characterized in that**
the guide roll (13) is adjustable, allowing the support surface (S_F) of the continuous belt (10) to become extendable for the support of the material web (10) and/or
the continuous belt (10) can be guided over the roll (11).

19. Device in accordance with one or several of the claims 10 through 18, **characterized in that**
it's employment is in the dryer section of a machine for the production of corrugated board base paper.